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*Original Article*

# Comparative Effect of Myofascial Cupping Therapy to Stretching Exercises on Gastrocnemius Soreness

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## ABSTRACT

Background: Gastrocnemius muscle soreness often arises from overuse or insufficient recovery, leading to reduced dorsiflexion range of motion (ROM). Emerging therapies, including myofascial cupping therapy and traditional stretching, aim to alleviate muscle soreness and enhance ROM.

Objective: The study aimed to compare the effects of myofascial cupping therapy and stretching exercises on reducing gastrocnemius soreness and determining which method is more effective in improving the dorsiflexion ROM of the ankle joint.

Methods: A quasi-experimental design was employed with convenient sampling. The study included 36 participants, divided into two intervention groups: myofascial cupping and stretching exercise. Both interventions were administered, and soreness was assessed using a 10-point Visual Analog Scale (VAS). Active dorsiflexion of each ankle was measured using a goniometer. Data analysis was conducted using SPSS version 23, with an alpha level set at 0.05.

Results: The study found a statistically significant decrease in soreness levels post-intervention in both groups. Participants in the myofascial cupping group demonstrated a mean soreness decrease from 5.2222 to 2.6667 with a standard deviation change from 2.21108 to 0.76696. In contrast, the stretching group showed a mean decrease from 5.2222 to 1.9444, with standard deviation changing from 2.21108 to 0.72536. Regarding ROM, the myofascial cupping group showed an improvement from an average of 4.3333 (SD = 1.94029) to 4.9444 (SD = 2.43678), while the stretching group showed changes from 4.3333 (SD = 1.94029) to 4.3333 (SD = 1.94029).

Conclusion: Both myofascial cupping therapy and stretching exercises were effective in reducing gastrocnemius soreness and improving dorsiflexion ROM of the ankle joint. However, myofascial cupping therapy was more significant in its effects, making it a preferable intervention over stretching exercises for treating immediate onset muscle soreness (IOMS) and improving ROM.

Keywords: Calves, Cupping, Dorsiflexion ROM, Gastrocnemius, Gastrocnemius soreness, Myofascial cupping therapy, Rehabilitation, Stiffness.

## INTRODUCTION

The gastrocnemius muscle, a pivotal component in the lower limb, plays an essential role in various activities such as walking, running, and maintaining upright posture. Functionally, this muscle is primarily responsible for plantarflexing the ankle joint and lifting the heel, enabling forceful movements necessary for locomotion (1). Anatomically, it is characterized as a pinnate, bi-articular muscle, predominantly composed of white, anaerobic muscle fibers (2, 3). Innervation of the gastrocnemius and its additional heads is provided by the tibial nerve, underscoring its integral role in calf muscle functionality. The muscle's susceptibility to injury is often linked to its connection with the Achilles tendon, a critical aspect of its anatomical structure (4). Additionally, the muscle benefits from the mechanical efficiency of the ankle joint's lever system, facilitating the ease of performing forceful activities (5).

Pain in the lower limb can stem from various causes, including prolonged periods of inactivity or extended standing (6). Often, this discomfort is accompanied by a limited range of motion and overstretching in the posterior compartment of the lower leg. Muscular soreness, particularly in the gastrocnemius, is a common complaint among individuals with restricted dorsiflexion in the ankle joint

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(7). Traditional assessment of the muscle's flexibility involves extending the knee and dorsiflexing the toes, although it's noteworthy that the foot does not typically achieve such a degree of dorsiflexion during activities like running (8).

The treatment of immediate onset muscle soreness (IOMS) encompasses a variety of methods, ranging from manual approaches such as stretching and myofascial release via dry cupping, to the use of electric modalities (9). Stretching exercises, which apply force to musculotendinous structures to elongate them, aim to enhance joint range of motion (ROM), decrease stiffness, and prepare for physical activities. However, the absence of a standardized metric unit to quantify stretching intensity poses challenges in terms of reliability and comparability (10, 11, 12).

An alternative and increasingly popular treatment is myofascial release, commonly known as dry cupping. Originating as a traditional Chinese healing practice, cupping therapy has gained global recognition. This technique utilizes cups made of various materials such as bamboo, straw, plastic, or silicone, and creates suction to stimulate specific acupressure points. This suction generates localized hyperemia, enhancing blood flow to the targeted muscle, thereby alleviating pain and related symptoms (13). A more advanced form of this therapy, involving additional negative pressure to pull the skin and fascia into the cup, further augments the pain reduction effect (14). Research has demonstrated the immediate benefits of dynamic dry cupping in improving joint ROM and reducing soreness (15).

Despite the growing popularity of both stretching exercises and myofascial cupping therapy for managing muscle soreness and enhancing ROM, there is a scarcity of research directly comparing their efficacy, especially in the context of gastrocnemius soreness and dorsiflexion ROM. This study seeks to fill this research gap by conducting a comparative analysis of the effects of myofascial cupping therapy and stretching exercises on gastrocnemius soreness and dorsiflexion ROM. The findings from this study are anticipated to provide valuable insights for healthcare professionals, athletes, and individuals seeking effective strategies for managing muscle soreness and improving joint flexibility, ultimately contributing to enhanced musculoskeletal health and functional movement.

## MATERIAL AND METHODS

In this quasi-experimental study, conducted over a period of four months following the approval of the synopsis, a total of 36 sedentary individuals (18 males and 18 females) from Government College University Faisalabad were recruited using convenient sampling. The study targeted healthy individuals, specifically focusing on those who had not previously experienced cupping therapy or were accustomed to stretching exercises at the time of enrollment. Participants ranged in age from 18 to 35 years and included both genders. The exclusion criteria were stringent, disqualifying individuals with deep venous thrombosis, lumbosacral radiculitis, venous stasis ulceration, tumors in the affected heel area, or those on blood-thinning medications.

Data collection tools included a goniometer for measuring range of motion (ROM), a comprehensive cupping kit consisting of various cups and a suction gun, and a 10-point Visual Analog Scale (VAS) for assessing soreness. The research adhered to the ethical guidelines and regulations set forth by the Ethical Committee of Government College University Faisalabad. Participants self-reported their age, height, and weight, which were then used to allocate them into one of two groups, ensuring an equal distribution of nine males and nine females in each group.

The study comprised two intervention groups: the Myofascial Cupping Therapy Group and the Stretching Exercise Group. In the cupping group, participants underwent a single round of cupping protocol on the belly of the right gastrocnemius muscle after a five-minute rest. Post-intervention, ROM was measured using the same method as pre-intervention, and participants rated their soreness on the 10-point VAS scale. In the stretching group, participants received passive stretching exercises for the calf muscles. This involved the participant lying in a supine position while the researcher applied force to the plantar aspect of the foot until a stretch was felt in the calf region. Each stretching session lasted for 30 seconds, followed by a 30-second rest, repeated over a 10-minute period.

Data analysis was conducted using SPSS version 23. The statistical methods employed included paired T-tests to assess within-group changes and independent T-tests for between-group comparisons. This comprehensive methodology aimed to ensure a robust and reliable assessment of the comparative effects of myofascial cupping therapy and stretching exercises on gastrocnemius muscle soreness.

## RESULTS

Figure 1: Dynamic Cupping therapy Soreness Pre-Intervention

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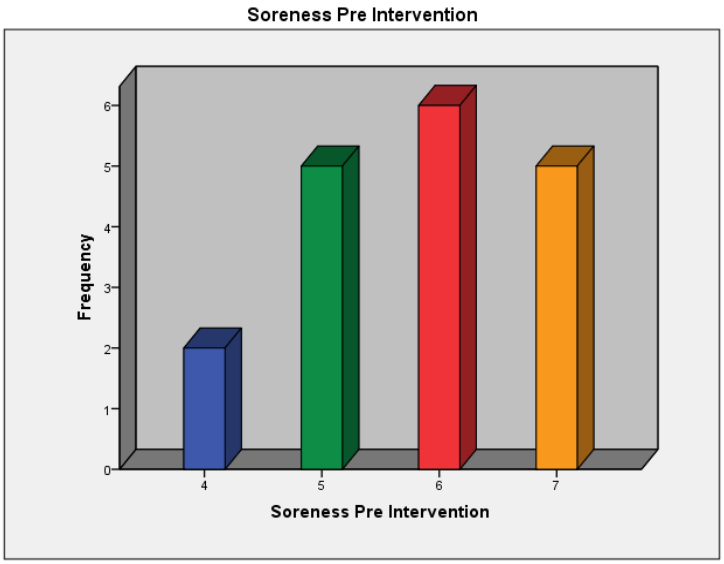
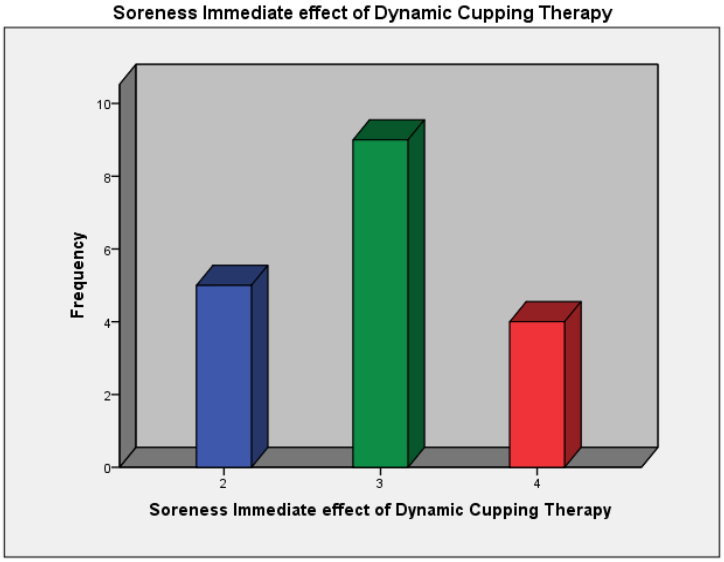


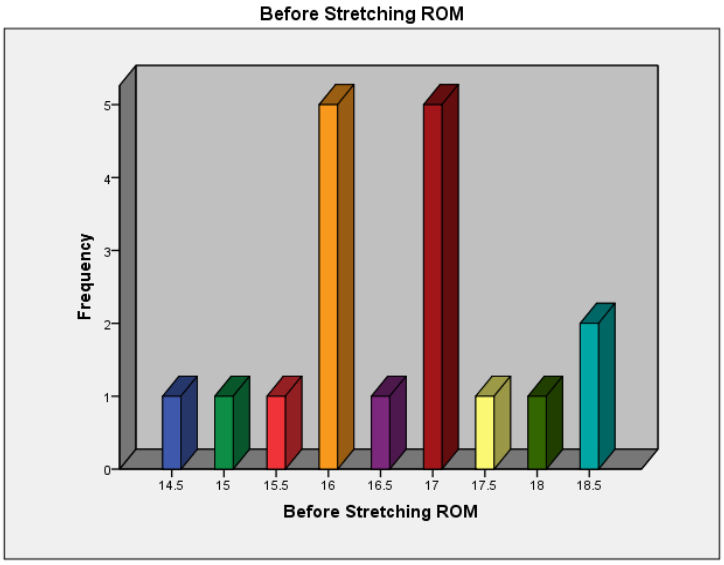

For this study, 18 participants experiencing soreness were selected before applying dynamic cupping therapy. The severity of their soreness was measured using the Visual Analog Scale (VAS), which ranges from 0 to 10. Among these participants, 2 marked their soreness at the 4th point on the VAS, 5 marked at the 5th point, 6 marked at the 6th point, and 5 marked at the 7th point.

Figure 2: Soreness immediate effect of dynamic cupping Therapy




The study involved 18 participants who were assessed for soreness after receiving dynamic cupping therapy to observe its immediate effect. The severity of their soreness was measured using the Visual Analog Scale (VAS), which ranges from 0 to 10. A decrease in soreness levels was noted. Among these participants, 5 marked their soreness at the 2nd point on the VAS, while 9 participants marked at the 3rd point, and 4 participants also marked at the 3rd point.

Figure 3: Before Stretching ROM




The study measured the Range of Motion (ROM) of 18 participants using a goniometer before they underwent stretching exercises. The frequency distribution, as depicted in a bar chart, indicated varied ROM measurements among the participants: 1 participant had a ROM of 14.5 degrees, 1 participant had a ROM of 15 degrees, 1 participant had a ROM of 15.5 degrees, 5 participants had a ROM of 16 degrees, 1 participant had a ROM of 16.5 degrees, 5 participants had a ROM of 17 degrees, 1 participant had a ROM of 17.5 degrees, 1 participant had a ROM of 18 degrees, and 2 participants had a ROM of 18.5 degrees.

Figure 4: After Stretching ROM

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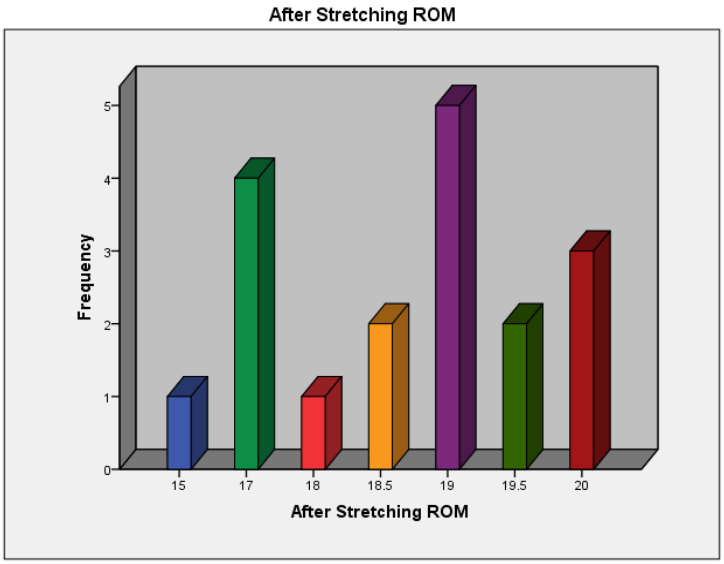


After the application of stretching exercises to the 18 participants, their Range of Motion (ROM) was reassessed using a goniometer. The results, as displayed in a bar chart showing frequency distribution, were as follows: 1 participant demonstrated a ROM of 15 degrees, 4 participants had a ROM of 17 degrees, 1 participant had a ROM of 18 degrees, 2 participants had a ROM of 18.5 degrees, 5 participants had a ROM of 19 degrees, 2 participants had a ROM of 19.5 degrees, and 3 participants had a ROM of 20 degrees.

**Table 1:** Paired Sample Test Soreness Pre-Intervention – Soreness Immediate effect of Dynamic Cupping Therapy

| | | Paired Differences | | | | | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | |
| | | | | | Lower | Upper | |
| Pair 1 | Soreness Pre-Intervention – Soreness Immediate effect of Dynamic Cupping Therapy | .52778 | .84468 | .14078 | .24198 | .81358 | .001 |

The statistical analysis of the data presented reveals a mean of 0.52778 and a standard deviation of 0.84468, with the degrees of freedom being 17. The significance value obtained is 0.001. Given that this value is less than 0.05 ($p < 0.05$), it indicates a statistically significant difference in the levels of soreness before and immediately after the application of dynamic cupping. This suggests that the intervention had a considerable impact on reducing soreness among the participants.

**Table 2:** Paired Sample Test Before Applying Dynamic Cupping Therapy ROM – After Applying Dynamic Cupping Therapy ROM

| | | Paired Differences | | | | | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | |
| | | | | | Lower | Upper | |
| Pair 1 | Before Applying Dynamic Cupping Therapy ROM – After Applying Dynamic Cupping Therapy ROM | -1.19444 | 1.14191 | .19032 | -1.58081 | -.80808 | .028 |

The statistical analysis of the data related to dorsiflexion Range of Motion (ROM) presents a mean change of -1.19444 and a standard deviation of 1.14191, with 17 degrees of freedom. The significance value reported is 0.028. Since this value is less than 0.05 ($p < 0.05$), it signifies a statistically significant difference between the values of dorsiflexion ROM before and immediately after the application of dynamic cupping. This indicates that the dynamic cupping intervention had a significant effect in altering dorsiflexion ROM among the participants.

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**Table 3:** Paired Sample Test Soreness Pre Intervention – Soreness Immediate effect of stretching

| | | Paired Differences | | | | | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | |
| | | | | | Lower | Upper | |
| Pair 1 | Soreness Pre-Intervention – Soreness Immediate effect of stretching | -.44444 | .78382 | .18475 | -.83423 | -.05466 | .028 |

In the table provided, the mean is 0.44444, with a standard deviation of 0.78382, and the degrees of freedom are 17. The significance value is 0.028, which indicates that $p < 0.05$. Therefore, there is a significant difference between the levels of soreness before and the immediate effects after applying stretching.

**Table 4:** Paired Sample Statistic before and after stretching ROM

| Paired Samples Statistics | | | | | |
|---|---|---|---|---|---|
| | | Mean | N | Std. Deviation | Std. Error Mean |
| Pair 1 | Before stretching ROM | 5.2222 | 18 | 2.21108 | .52116 |
| | After stretching ROM | 4.3333 | 18 | 1.94029 | .45733 |

The table presents the mean and standard deviation of dorsiflexion Range of Motion (ROM) before and after applying dynamic cupping. Prior to the application of stretching, the mean dorsiflexion ROM is 5.2222 with a standard deviation of 2.21108. Following the application, the mean changes to 4.3333, and the standard deviation is 1.94029.

**Table 5:** Independent T Test

| | Groups | N | Mean | Std. deviation | Sig. (2-tailed) | Std. error mean |
|---|---|---|---|---|---|---|
| Soreness Immediate effect of Dynamic Cupping Therapy & Stretching | 1 (Dynamic Cupping Therapy)<br>2 (stretching) | 18<br>18 | 2.6667<br>1.9444 | .76696<br>.72536 | .006<br>.006 | .18078<br>.17097 |
| ROM After Applying Dynamic Cupping Therapy & Stretching | 1(Dynamic Cupping Therapy)<br>2(stretching) | 18<br>18 | 4.3333<br>4.9444. | 1.94029<br>2.43678 | .027<br>.411 | .45733<br>.57436 |

The data analysis reveals that after applying stretching exercises, the mean and standard deviation for soreness are 1.9444 and 0.72536, respectively. When dynamic cupping therapy (DCT) is applied, these values are 2.6667 for the mean and 0.76696 for the standard deviation. In terms of Range of Motion (ROM), the mean and standard deviation after stretching are 4.9444 and 2.43678, respectively, while after DCT, they are 4.3333 and 1.94029.

The significance value for soreness after both cupping therapy and stretching is 0.006, indicating a significant difference for both treatments on soreness levels. For ROM, the significance value after DCT is 0.027, demonstrating a significant improvement, whereas after stretching, it is 0.411, which does not indicate a significant change. This suggests that DCT has a more pronounced effect on ROM compared to stretching.

Based on the data analysis and application of the T-test, it is concluded that DCT is more effective in reducing soreness and improving ROM than stretching exercises. This highlights the potential of DCT as a more impactful treatment option in managing muscle soreness and enhancing joint flexibility.

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## DISCUSSION

This quasi-experimental study provides a comprehensive analysis comparing the effectiveness of myofascial cupping therapy and stretching exercises on gastrocnemius soreness, ROM, and flexibility. The study's findings corroborate with existing research, underscoring the potential of these manual therapy techniques in enhancing ROM and improving quality of life for individuals suffering from compromised flexibility and soreness.

A significant reference point for this study is the research by Markowski et al. (2014), which suggested that Chinese cupping might offer a low-risk and effective treatment for subacute and chronic low back pain. This aligns with the current study's findings, where cupping demonstrated immediate reduction in pain and muscle sensitivity, thereby facilitating quicker transition to functional movement training (9). Similarly, Mohamed et al. (2022) provided evidence supporting the use of cupping therapy in musculoskeletal and sports rehabilitation, highlighting its role in pain alleviation, albeit with low to moderate evidence (16). These findings are consistent with the outcomes observed in the current study.

In 2021, Smith et al. conducted a study involving three groups to evaluate the impact of dry cupping on gastrocnemius muscle soreness and ROM. Their methodology included applying dry cupping to the gastrocnemius and assessing the effects on soreness and ROM using a 10-point VAS scale and repeated measures ANOVAs. The study found significant differences in muscle discomfort between the cupped and non-cupped calves, suggesting that dry cupping could reduce muscle soreness post-exercise, though its effect on ROM was not substantial (17).

Wood et al. (2021) explored the efficacy of dry cupping in patients with non-specific low back pain and chronic neck discomfort. The study contrasted static dry cupping with an active movement protocol and myofascial decompression, measuring pressure pain threshold and ROM. Findings indicated that dry cupping procedures enhanced ROM and pain threshold, with myofascial decompression being particularly effective in treating musculoskeletal pain and increasing ROM (18).

Corrêa et al. (2021) investigated the impact of cupping therapy on the flexibility and pressure pain threshold of soccer players' posterior muscle chain. Their study, utilizing T-tests for statistical analysis, found a significant increase in flexibility post-intervention, affirming the potential benefits of cupping in sports contexts (19).

Despite these promising findings, the study presents certain limitations. The sample size, although adequate for initial exploration, may not fully represent the wider population. Additionally, the study's duration and the singular focus on the gastrocnemius muscle may not encapsulate the comprehensive effects of the therapies on overall musculoskeletal health. Moreover, the subjective nature of pain assessment through the VAS scale, while valuable, may introduce variability in individual pain perception and reporting.

The strengths of this study lie in its methodological rigor and the comparative approach taken to evaluate two distinct but complementary therapies. By employing a randomized and controlled design, the study minimizes bias and allows for a more accurate assessment of the therapies' effects. However, further research involving larger sample sizes, diverse demographic groups, and extended duration is needed to validate and expand upon these findings.

The study offers valuable insights into the comparative effectiveness of myofascial cupping therapy and stretching exercises on gastrocnemius muscle soreness, ROM, and flexibility. While both therapies demonstrated benefits in terms of pain reduction and improved flexibility, the study highlights the need for ongoing research to further understand their full potential and applicability in various clinical and rehabilitation settings.

## CONCLUSION

The study concludes that both myofascial cupping therapy and stretching exercises demonstrate effectiveness in reducing gastrocnemius muscle soreness and improving the dorsiflexion range of motion in the ankle joint. These interventions show a positive impact on immediate onset muscle soreness (IOMS). However, it is notable that dry cupping therapy yields more significant results compared to stretching exercises. Consequently, dry cupping therapy is considered a superior intervention for treating IOMS and enhancing the range of motion of the ankle joint.

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